Exploring Privilege in the Digital Divide

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Exploring Privilege in the Digital Divide: Implications for Theory, Policy, and Practice

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Abstract

Background and Objectives: The digital revolution has resulted in innovative solutions and technologies that can support the well-being, independence, and health of seniors. Yet, the notion of the "digital divide" presents significant inequities in terms of who accesses and benefits from the digital landscape. To better understand the social and structural inequities of the digital divide, a realist synthesis was conducted to: inform theoretical understandings of information and communication technologies (ICTs); understand the practicalities of access and use inequities; uncover practices that facilitate digital literacy and participation; and recommend policies to mitigate the digital divide. *Research Design and Methods*: A systematic search yielded 55 articles published between 2006 and 2016. Synthesis of existing knowledge, combined with user-experience elicited through a deliberative dialogue session with community stakeholders (n=35), made visible a pattern of privilege that determined individual agency in ICT access and use. *Results*: Though age is consistently centralized as the key determinant of the digital divide, our analyses, which encompassed both van Dijk's resources and appropriation theory and intersectionality, appraised this notion and revealed that age is not the sole determinant. Findings highlight the role of other factors that contribute to digital inequity among community-dwelling middle-aged (45-64) and older (65+) adults, including education, income, gender, and generational status. *Discussion and Implications*: Informed by results of a realist synthesis that was guided by intersectional perspectives, a conceptual framework was developed outlining implications for theory, policy, and practice to address the wicked problem that is the digital divide.

Keywords: Technology, Access and Utilization of Services, Theory, Public Policy, Quality of Life, Social Roles and Social Factors, Digital Divide, Realist Synthesis

Exploring Privilege in the Digital Divide: Implications for Theory, Policy, and Practice

The digital revolution has resulted in rapid technology development and generation of products that can enable enhanced access, management, and circulation of knowledge and information. With growing aging populations, innovative technology solutions play a pivotal role in enriching the quality-of-life, health, and independence of older persons. Information and communication technologies (ICTs), products that enable information storage, retrieval, manipulation, transmission, or reception in digital form, can: improve access to goods and services; generate and maintain a safe and secure independent living environment; facilitate self-management of age-related challenges; and enable social connectivity and participation (Sixsmith & Gutman, 2013). Despite the prospect for enhancing the everyday lives of older people, the inaccessibility of ICTs has resulted in significant inequities in respect to who can access, use, and benefit from these interventions (e.g., Atkinson, Black, & Curtis, 2008; Casado-Muñoz, Lezcano, & Rodríguez-Conde, 2015; Graham, 2010). Understood as "the digital divide," this notion became a mainstream concept after the 1995 report, 'Falling through the Net', which discussed the unequal access to emerging ICTs within and between countries (Yu, 2011).

While the first decade of research on the digital divide from the late 1990s to early 2000s focused on physical access to ICTs (e.g., ability to purchase a computer or Internet subscription), and captured inequalities of physical access to ICTs through exploring demographic differences in digital usage, including income, education, geographic location, gender, and age, as more or less separate entities, more recent evidence incorporates combined social attributes, such as educational attainment (van Deursen, van Dijk, & Peters, 2011), income (Atkinson et al., 2008) and gendered roles and responsibilities (Casado-Muñoz et al., 2015). However, no studies have considered how the interlocking of these determinants can introduce ICT access and use inequities.

This is a 'wicked' problem – one that is complex in nature and often requires multiple solutions, transdisciplinary expertise, and knowledge from a variety of disciplines and sectors (Boger et al., 2016; Riva et al., 2014). Given the importance of ICTs, a better understanding of the social determinants of inequities (e.g., age, gender, income and ability) that exist across middle-aged and older adults in accessing and using ICTs is crucial for developing policy and practice (Fisk, 2003) and addressing this wicked problem. Hence, this study was premised notionally on conceptions of *social justice,* which we define for our research purpose as: the fair and just access to important resources and opportunities regardless of one's social identit(ies) and position(s) held in society in order to achieve and sustain optimal health and wellbeing (Walster & Walster, 1975).

To this end, while employing a framework that prioritizes social justice, a comprehensive knowledge synthesis of recent knowledge on the digital divide and a critique of this by community stakeholders was undertaken. Specifically, a realist synthesis was conducted to develop understandings of how and why certain middle-aged and older adults have better access to or knowledge of, and thus make use of and benefit from, ICTs while other groups are unable to access, have little knowledge of, or are unable to use and benefit from technology. This nuanced knowledge synthesis approach has an explanatory focus which uses a theory-driven evaluation of the literature targeting mechanism(s) of the how and why complex interventions thrive or fail, in particular setting(s) (Pawson, Greenhalgh, Harvey, & Walshe, 2005).

Theoretical Framework

To determine the most relevant theoretical perspective for this realist synthesis, existing digital divide theories were explored and one was selected to guide the analysis. van Dijk's (2012) resources and appropriation theory describes multiple mechanisms relevant to ICT access

that encompass mental, material, social, cultural, and temporal contexts. Using various components of this analytical perspective, three primary mechanisms of the digital divide: resources, motivation, and skills were captured within the analysis, which produced an overview of the key functional aspects of the digital divide but did not address the social complexities. As such, a secondary analysis, utilizing an intersectional framework was conducted. Intersectionality is a research and policy paradigm (Hancock, 2007), historically rooted in black, indigenous, and third world feminism, as well as queer and post-colonial theory (Hankivsky, 2014). Central tenets of intersectionality (Hankivsky, 2011; Hankivsky, Cormier, & De Merich, 2009) affirm that: (i) individual lives cannot be reduced to single traits, nor can single traits accurately depict understandings of individual experiences; (ii) person categories or locations are socially constructed, fluid, flexible, and inseparable, shaped by social processes, structures, power relations, and influenced by time and place; and (iii) prioritization of social justice and equity are of utmost importance. Application of these principles made visible attributes of privilege that contribute to the digital divide, which are highlighted by the multitude of barriers experienced by social groups situated in disadvantaged positions.

Guided by both the resources and appropriation theory and intersectionality, this review study appraised how and why certain groups of community-dwelling middle-aged (aged 45-64) and older (aged 65+) adults can access and use ICTs, while other groups have little knowledge of, or are unable to access or use certain technologies. A realist synthesis was conducted to: (i) inform theoretical understandings of ICTs; (ii) understand the practicalities of access and use inequities; (iii) uncover practices that facilitate digital literacy and participation; and (iv) recommend policies to mitigate the digital divide.

Research Design and Methods

Study Approach

A realist synthesis approach (Rycroft-Malone et al., 2012) was selected to collect and review the body of evidence (published between 2006 and 2016) on the characteristics of middle-aged and older adults that affect exclusion from ICT use. Since traditional systematic review approaches have been scrutinized for methodological rigidity (McCormack, Wright, Dewer, Harvey, & Ballintine, 2007), a realist synthesis was chosen as this approach allows for transdisciplinarity (Boger et al., 2016) and flexibility. The realist approach prioritizes conceptualization and refinement of theory for discerning the practicalities of why complex interventions (i.e., ICTs) are ineffective within particular contexts and situations (Greenhalgh, Wong, Westhorp, & Pawson, 2011) so as to inform systemic change (Rycroft-Malone et al., 2012). Key organizing principles of a realist synthesis include: context (i.e., broad social or geographical features); mechanisms (i.e., causal entities such as norms, belief systems, or practices or 'processes'); complex outcomes (i.e., intended or unintended result or consequence shaped by contexts and mechanisms); and interventions (that have been shaped by outcomes, interactions of resources or opportunities available to the population of interest) (Wong, Westhorp, Pawson, & Greenhalgh, 2013).

Review Design

The fundamental stages of a traditional systematic review broadly encompass: (1) defining the research question and scope of the review by clarifying inclusion and exclusion criteria; (2) searching for evidence; (3) appraising studies and extracting data; (4) synthesizing the evidence and drawing conclusions; and (5) disseminating recommendations and conclusions with key stakeholders (Rycroft-Malone et al., 2012). Building on these stages, our realist

synthesis also integrated the following: (1) involving a community stakeholder partner (name removed for review, a community-based regional information and referral service in Vancouver, Canada) when defining the scope of the project and throughout the review process; (2) ensuring that the systematic search and analysis of evidence was purposive and theoretically driven by both the resources and appropriation theory (van Dijk, 2012) and intersectionality (Crenshaw, 1991; Hankivsky, 2011) with the aim of bridging the two theories for refinement; (3) incorporating multiple sources and types of information as evidence; (4) ensuring an iterative review process; and (5) synthesizing findings in a way that provides potential solutions for bridging the digital divide by informing research, policy, and practice.

Search Strategy

Prior to conducting a systematic search for literature, a researcher worked with a University librarian to define the specific criteria, including determining search terms conducive to capturing range (sensitivity) and relevance (specificity) in the available literature. Relevant papers from multiple disciplines were purposively sought by searching multidisciplinary databases (Table 1) using three sets of search terms that relate to middle-aged and older adults, ICTs, and the digital divide (Table 2). We limited our literature to the decade (i.e., 2006 to 2016) as earlier review articles had described the digital divide up until 2006 (van Dijk, 2006), and since then, the technology landscape has changed significantly.

English-language papers of empirical research or systematic review conducted in any country (to capture cross-cultural differences) that focused on middle-aged and older adults, ICTs, and the digital divide were included. In addition, large-scale, stand-alone surveys, and other relevant grey literature were identified through targeted searching strategies: expert-identification (e.g., recommendations from project partner, name removed for review) and hand-

searching (e.g., identifying studies from reference lists of the literature collected). Figure 1 depicts the search results according to the different phases of the realist synthesis search strategy.

Data Synthesis and Analysis

Relevant information from the final subset of 55 articles were extracted by two researchers and inputted into Covidence (www.covidence.org) according to pre-established categories that were informed by the resources and appropriation theory and intersectionality. Since there was substantial heterogeneity among studies, most of the data were descriptively synthesized. Two reviewers independently appraised the quality of the included studies using an assessment criterion that matches the study design (e.g., COREQ criteria for qualitative studies) (Tong, Sainsbury, & Craig, 2007) and any disagreements were resolved by a third reviewer. Primary analysis informed by the resources and appropriation captured three primary mechanisms of the digital divide: resources, motivation, and skills, while the secondary, intersectional analysis identified multiple social and structural inequities that may contribute to the digital divide.

Iterative Knowledge Production and Dissemination

To facilitate an iterative knowledge generation and sharing process, two knowledge cafés, using a world café format (Brown & Isaacs, 2005) were hosted. After the development of our preliminary findings, we sought to understand and interpret our findings more in-depth by obtaining feedback with local stakeholders (n=35 participants: middle-aged and older adults, seniors' service providers, industry professionals, and academics) during a knowledge café in Vancouver, British Columbia in August 2016. Subsequent to this and the completion of our final analysis, findings were shared with national stakeholders (n=10 participants: academics, service

providers, and policy professionals) during a second knowledge café in Montreal, Quebec in October 2016.

At each café event, participants were hosted at small roundtables, each with one facilitator and one note-taker from the research team, and concurrently engaged in small group discussions about the themes, which were subsequently shared during a large group forum. The audio-recorded café conversations were transcribed and informed data analysis and dissemination. Data were coded and key quotes were extracted to contextualize and substantiate findings from the realist synthesis. Ethics approval was obtained from a University Institutional Review Board and participant names have been removed to protect identities.

Results

Our final subset of 55 articles encompasses an international compilation of studies, which reflect the differences in ICT access and use across the wide range of global contexts and localized mechanisms. Studies included in this review are representative of the following countries: United States (U. S.; n=18), England (n=5), Spain (n=5), China (n=4), Canada (n=3), Australia (n=3), Netherlands (n=3), Sweden (n=2); and one each from: Chile, Italy, Portugal, Switzerland, Serbia, Japan, Korea, Germany, Nigeria, Israel, Ireland, and France. In terms of the types of methods reported in the studies, the final subset captured: quantitative (n=32; survey studies), qualitative (n=11; interview studies), mixed-methods (n=10; combination of survey and interview studies), and randomized controlled trials (n=2; focused on training and skills development).

Detailed findings of the realist synthesis, which integrate stakeholder feedback from the first knowledge café, are thematized within the first three organizing principles of the realist synthesis method: sociodemographic determinants of ICT adoption and use (context); ICT

resources, motivation, and skills (mechanisms); and ICT disparities across social intersections (outcomes). The last organizing principle (intervention) introduces a conceptual framework (presented in the Discussion section), which undertakes a social justice approach for mitigating ICT access and use challenges within the current digital landscape.

Context: Sociodemographic Determinants of ICT Adoption and Use

The context of the digital divide, in terms of ICT adoption and use, is presented according to the broad social or geographical features. Statistical data from large population studies (Anderson & Perrin, 2016; Office for National Statistics, 2016; Statistics Canada, 2013), and peer-reviewed studies (Haight, Quan-Haase, & Corbett, 2014; Hall, Bernhardt, Dodd, & Vollrath, 2015; Kiser & Washington, 2015; Niehaves & Plattfaut, 2014; Omotayo, 2015; van Deursen & van Dijk, 2014; van Dijk, 2012), indicate an association between non-use of and non-access to the Internet and several sociodemographic variables, including education, income, age, and gender. Other social determinants highlighted within the literature that had less consistent findings (Table 3) include: disability status, immigration status, urban/rural residence, and relationship status.

Education. According to Graham (2010), "the most salient divider in the American population with respect to attitudes towards ICT is education (p. 999)." Indeed, education is the primary predictive sociodemographic variable identified by several studies and is clearly highlighted in population statistics (Anderson & Perrin, 2016; Office for National Statistics, 2016; Statistics Canada, 2013). The higher the education level, the greater the likelihood an individual is to access and use ICTs, mainly through the use of computers and the Internet (Atkinson et al., 2008; Chang, McAllister, & McCaslin, 2015; Chu, Huber, Mastel-Smith, & Cesario, 2009; Del Prete, Calleja, & Cervera, 2011; Friemel, 2016; Gazibara et al., 2016; Haight

et al., 2014; Lee & Kim, 2014; Lissitsa & Chachashvili-Bolotin, 2015; McDonough & Kingsley, 2015; Neves & Amaro, 2012; Niehaves & Plattfaut, 2014; Tirado-Morueta, Hernando-Gómez, & Aguaded-Gomez, 2016; Wright & Hill, 2009; R. P. Yu, Ellison, & McCammon, 2015). Importantly, education is influenced by additional social factors such as income, occupation, and wealth, which also interact with age and gender to create considerable variation across population subgroups (Duncan, Daly, McDonough, & Williams, 2002).

Income. Although low-income has been identified as a key deterrent of Internet use (van Deursen, van Dijk, & Peters, 201;mAtkinson et al., 2008), Haight et al. (2014) have also proclaimed income "in digital divide research as a key source of inequality" and "continues to be a decade later (Haight et al., 2014, p. 514)." Middle-aged and older adults who have higher incomes and financial means to purchase a computer and pay for Internet connection are more likely to use ICTs (Atkinson et al., 2008; Birkland & Kaarst-Brown, 2012; Chang et al., 2015; Choudrie, Ghinea, & Songonuga, 2013; Del Prete et al., 2011; Echt & Burridge, 2011; Friemel, 2016; Gazibara et al., 2016; Graham, 2010; Haight et al., 2014; Ihm & Hsieh, 2015; Kania-Lundholm & Torres, 2015; Lee & Kim, 2014; McDonough & Kingsley, 2015; Neves & Amaro, 2012; Niehaves & Plattfaut, 2014; Tirado-Morueta et al., 2016; Wong, Law, Fung, & Lam, 2009; Wright & Hill, 2009). From both an intersectional and Marxist perspective, income and education are not mutually exclusive as one produces returns on the other and vice-versa (Wright & Perrone, 1977). As such, the interrelation between education and income required further assessment of positionality as a determinant of ICT access and use (see below secondary analysis and Figure 2).

Age. While chronological age does not appear causally linked to ICT access and use, older adults, in general, are less likely to access or use the Internet (Abbey & Hyde, 2009; Birkland & Kaarst-Brown, 2012; Chang et al., 2015; Friemel, 2016; Haight et al., 2014; Ihm &

Hsieh, 2015; Kiser & Washington, 2015; Niehaves & Plattfaut, 2014; Peral-Peral, Arenas-Gaitán, & Villarejo-Ramos, 2015; van Deursen & van Dijk, 2011; van Dijk, 2012). For instance, among older adults over age 70,

> the relation between age and Internet use seems not to be linear but rather exponential. Only 4.9% of the seniors in the age group of 85+ years are using the Internet regularly, and within every 5 years younger cohort, this share approximately doubles (9.4%, 19.7%, 40.0%) (Gazibara et al., 2016, p. 324).

Accordingly, while age may be useful for informing policy and program planning and development, it is important to consider the implications and gradations of this determinant. Generational status, for example, is particularly relevant when designing for cohorts of individuals who share a collective consciousness shaped by past public discourses, objects and situations associated with life-changing technology and innovation events (Sackmann & Weymann, 1994). Subsequently, more nuanced comprehensions of age are being explored, including the conceptual use of cohort rather than chronological age, which may have more powerful explanatory potential for the digital divide through its ability to capture familiarity and life stage as new technologies are being introduced (Birkland & Kaarst-Brown, 2012; Casado-Muñoz et al., 2015).

Gender. Findings on the influence of gender on ICT access and use were inconsistent. In general, majority of studies found no gender differences in access and use (Friemel, 2016; Gazibara et al., 2016; Graham, 2010; Ihm & Hsieh, 2015; McDonough & Kingsley, 2015; Neves & Amaro, 2012; Peral-Peral et al., 2015; Van Volkom, Stapley, & Amaturo, 2014). While some studies reported that women tend to engage more with social networking websites (Haight et al., 2014; Ihm & Hsieh, 2015; van Deursen & van Dijk, 2014) and used computers and accessed the Internet more than men, other studies reported the opposite (Casado-Muñoz et al., 2015; Choudrie et al., 2013; Gan et al., 2016; Jung et al., 2010; Lissitsa & Chachashvili-Bolotin, 2015; Wong et al., 2009; Yu et al., 2015). For example, in an Italian sample of adults aged 65-74, men

were more likely to own computers and use the Internet than women, yet women used mobile devices to access the Internet more than men, and both women and men had similar use patterns of e-readers and tablets (Colombo, Aroldi, & Carlo, 2015). Comparatively, a study of 500 urban older adults (65+) in Portugal found that mobile and computer use did not differ based on gender (Neves & Amaro, 2012). Such findings are useful although they do not fully describe potential underlying gendered contexts that pertain to ICT access and use among middle-aged and older adults.

Mechanisms: ICT Resources, Motivation, and Skills

ICT resources, motivation and skills encapsulate the causal entities: norms, belief systems, practices or 'processes' which frame the mechanisms of the digital divide. Critical to access and use of ICTs are resources that facilitate opportunities to acquire and use ICTs (van Dijk, 2012). According to Colombo et al. (2015), ICT use is associated with the home environment, family and peer relationships, and opportunities that relate to and support daily activities (e.g., social participation). Notably, education and having the financial means to purchase and maintain a computer and acquire Internet access are the primary catalysts for ICT access and use (Chang et al., 2015; Ihm & Hsieh, 2015; Larsson, Larsson-Lund, & Nilsson, 2013). 'The home' was highlighted as the preferred place for ICT use and skills development (Atkinson et al., 2008; Chang et al., 2015; Chu et al., 2009; Larsson et al., 2013). For instance, Chu et al. (2009) discovered that after a six-week training on e-health information access with older adults, among participants who could not afford a personal computer, only 1% drove to the nearest public library to use the Internet, while 62% who owned personal computers and had an Internet subscription continued to access health information online. Such findings, again, suggest that income and education work hand-in-hand as determinants of ICT use.

Beyond having the education and income to support ICT uptake and use, are individual, behavioural factors such as motivation and interest (van Dijk, 2012). Motivators for ICT usage (Table 4) include: information access, social connection, personal enjoyment, social encouragement, individual characteristics, and broadening knowledge. Importantly, social support was found to be the catalyst for ICT access and use, as middle-aged and older adults who are socially-supported engage more with ICTs (Larsson et al., 2013; Peral-Peral et al., 2015). The availability of social support from children and grandchildren, as well as peer-to-peer assistance and encouragement, can compel active engagement with new technologies (Friemel, 2016; Hashizume & Kurosu, 2012; Larsson et al., 2013; Niehaves & Plattfaut, 2014; Omotayo, 2015; Quan-Haase, Martin, & Schreurs, 2016; Tsai, Shillair, Cotten, Winstead, & Yost, 2015; Wu, Damnée, Kerhervé, & Ware, 2015). To this end, effective training and guidance of older adults to access and use ICTs for personal needs and social interests has reframed the digital divide (Cutler, 2015). For instance, there is consistent evidence demonstrating that Internet access and use of online social engagement platforms (such as Skype) can reduce social isolation and lower incidence of depression among older adults (Cutler, 2015).

Nonetheless, middle-aged and older adults with more exposure to ICTs generally have supportive family members who introduce them to new technologies and subsequently provide the necessary training (Chang et al., 2015):

> One of the things we did was gave her a tablet, taught her how to play one game, and that has opened up the discovery of a whole variety of applications, Internet access, and usage patterns that she didn't have. (Knowledge Café Participant: Male, Family Caregiver)

Yet, according to knowledge café discussions, there is a key difference between *encouraging* technology use and *pressuring* technology use:

> I think it [being digitally savvy] depends on the time people were first introduced to computers. If they were introduced when they were still working, it is a little bit easier than once they try it and suddenly someone is pushing on them, children, grandchildren, or someone like this. (Knowledge Café Participant: Female, Service Provider)

Conversely, summarized in Table 5 are detractors to ICT use, which can include personal beliefs, perception of little or no added value, lack of skills and familiarity, fear of cybercrime, and lack of interest. For many middle-aged and older adults, ICT adoption and usage are perceived as daunting, with little or no added value, while traditional modes of communication, such as face-to-face interaction and reading paper copies of books and newspapers, are preferred (Quan-Haase et al., 2016). Subsequently, such detractors can demotivate an individual and impact one's enthusiasm and willingness to learn and acquire technology usage skills.

Meanwhile, enthusiasm for technology and the willingness to learn new skills is connected to life-long technology discovery and adoption (van Dijk, 2012). The more ICT exposure an individual has, the more comfortable they become and the greater likelihood for continued use (Chang et al., 2015; Colombo et al., 2015; Friemel, 2016; Larsson et al., 2013). Some middle-aged and older people who do not use ICTs credit their non-use to lack of skills and training (Casado-Muñoz et al., 2015; McDonough & Kingsley, 2015; Niehaves & Plattfaut, 2014). Though some suggest that age is the reason people lack knowledge and skills, it appears to be more a function of generational experience (Casado-Muñoz et al., 2015; Graham, 2010; Ihm & Hsieh, 2015; Larson, Roth, Anker, & Carroll, 2005; Neves & Amaro, 2012). For instance, the level of pre-retirement computer exposure and usage is related to later-life Internet consumption such that those using computers prior to retirement tend to use computers more post-retirement (Friemel, 2016).

Tailored training and ongoing support are also critical aspects for ICT adoption among middle-aged and older adults and several studies report that tailored ICT training enhanced their ICT use (Chu et al., 2009; Lam & Lee, 2006; Larsson et al., 2013; McDonough & Kingsley, 2015). Emphasized by knowledge café participants, training considerations should include integrating ICT use into other programs of interest (e.g., photography course), being culturally

relevant and aligned with an individual's goals and use purposes (e.g., staying connected with family and friends). Moreover, engaging in already familiar activities and demonstrating how ICTs enhance these activities can promote understanding of and reveal the added value of ICTs (Niehaves & Plattfaut, 2014). Positive reinforcement in a supportive environment with ongoing assistance encourages ICT adoption and can simultaneously help determine specific ICT use issues, such as remembering passwords, navigating unfriendly user interfaces, managing technical jargon, and addressing hardware and software problems (e.g., computer freezing) (Damodaran, Olphert, & Sandhu, 2014):

> I think it's all about inspiring them and them seeing how it's actually going to integrate and help them in what they're doing in their lives already. There is a certain way of teaching them and being able to connect with them, and it is very different. (Knowledge Café Participant: Female, Service Provider)

Finally, ICT design features can either support or deter use and skill development for middle-aged and older adults who may have age-related physical challenges that pose barriers to technology use:

> I think, physically, some of those things [technology] aren't that good. Like arthritic fingers are about twice the size of anyone else's so when I go to press a button or a key, I get wrong answers half the time. So that part, as well as vision. I think those are physical barriers. (Knowledge Café Participant: Female, Older Adult)

Likewise, the role of technology generation should also take into account the ways older adults interact with specific ICTs based on their historical frames of reference (i.e. war, scarcity of resources, economic depression, previous work experience and upbringing) (Lim, 2010); and how such experiences shape the psychology of ICT interaction through personal ambition, purpose and age-related needs (Bouma et al., 2007). Design elements (accompanied by relevant technical support) which reflect on these factors, can promote technology acceptance and facilitate ICT self-efficacy and skills development (Tsai et al., 2015). Consideration for the types of technology older adults were exposed to in earlier life, combined with their current reasons for

engaging with certain ICTs, can result in innovations that enhance older adults' expectations on how they can use and what they can achieve through accessing specific technology services (and devices), such as the Internet (Lam & Lee, 2007).

Complex Outcomes: ICT Disparities Across Social Intersections

Shaped by contexts and mechanisms of the digital divide, the intended or unintended result or consequences depict complex outcomes of ICT disparities across social intersections. Following application of an intersectional lens, a pattern of privilege that influenced individual agency as it relates to ICT access and use over a life-course was made visible in the literature. The interaction of social locations and determinants appear to work in tandem, shaping one's opportunity to learn, adopt, and apply ICTs in their everyday lives. For instance, our analysis of facilitators and barriers to ICT use, according to social position, age, and other inequity markers (Table 6), revealed that individuals who held less prominent social positions, such as those reported as non-white or working class with limited education and income, were often encumbered with additional life challenges, such as disability, chronic health conditions, gendered roles and responsibilities, high stress manual labor employment, and immigrant challenges.

Thus, in addition to ICT use barriers associated with personal beliefs and issues relating to self-efficacy, many individuals are further challenged by economic factors, which prevent the ability to purchase computers or Internet subscriptions. Persons situated within impecunious positions must first navigate the public domain to seek out accessible, free or low-cost ICTs, which can be a cumbersome and inconvenient task for most people; and subsequently, the knowledge, understanding, and skills to reap the benefits of ICTs need to be acquired. If social support is required, this must also be sought. Hence, the collective effect of less influential social

positions, combined with other markers of inequity, demonstrates the multiple barriers to ICT access and use among disadvantaged groups.

In comparison, the difficulties most reported by individuals situated in more elevated social positions largely concern issues relating to self-efficacy, such as lack of familiarity, understanding, knowledge, and skills to access and use ICTs (Table 7). Access difficulties that stem from affordability challenges were not reported among White, educated, middle to upper class groups of middle-aged and older adults. Accordingly, findings (from the knowledge café and Quan-Haase et al., 2016) also highlight that some groups of retired, financially secure professionals who used computers during their careers, minimized and/or took for granted the potential benefits of ICT use. Persons in elevated social positions have the ability to *choose* whether or not to use ICTs or to rely on 'traditional' modes of communication, information access, banking, and so forth because it suits their lifestyle (Quan-Haase et al., 2016). Arguably, the notion of *choice* is a misnomer for disadvantaged persons with limited options since, often, they are financially, systemically, and structurally prevented from ICT access and use.

Generally, there appears to be more studies examining ICT use challenges among disadvantaged older groups (i.e., Table 6 versus 7); nevertheless, socioeconomic disparities continue to be an inherent part of the digital divide. The unfortunate irony that stems from inequitable access to ICTs, is that persons who are most likely to benefit from this intervention, are often the ones who experience the most significant barriers to access and use. For example, currently in Canada, there exists an abundance of senior-specific services that aim to enable older people to *age in the right place* (Golant, 2015) by helping them maintain their independence and improve their wellbeing, safety, and security in later life.

Yet, public health services and supports developed to assist older adults who are experiencing late-life challenges (such as mobility issues or social isolation) are only accessible online, and as a result, may not reach those who are most in need (Allen, Juillet, Paquet, & Roy, 2001; Office of the Seniors' Advocate, 2015). Hence, the social exclusion of individuals who occupy marginalized positions remains continuously perpetuated by systemic digital inequities. This knowledge is timely since technology solutions are constantly being developed to improve efficiency in the public sector; particularly as governments move toward an e-governance system where social services and resources are increasingly digitized (Allen et al., 2001). Operationally, the unintended consequence of a digitized society is that middle-aged and older adults who are most in need of access to public assistance (e.g., rent supplements, mental health services, home care) will become further disadvantaged due to their inability to access and use ICTs.

Discussion and Implications

In this study, we sought to better understand the current state of the digital divide as it pertains to middle-aged and older adults over the last decade. A realist synthesis was conducted to better understand the social and structural inequities of the digital divide through the application of two theoretical perspectives: the resources and appropriation theory (van Dijk, 2012) and intersectionality (Crenshaw, 1991; Hankivsky, 2011). Our analysis revealed several sociodemographic factors that interact to shape ICT access and use for middle-aged and older adults, including education, income, age, gender, disability status, immigration status, urban/rural residence, and relationship status. These factors lead to distinct positionalities of privilege and disadvantage that influence ICT access and use via differential barriers and facilitators experienced by different social groups.

Based on findings from this review, the resulting intervention, shaped by outcomes and interactions of resources or opportunities of the digital divide, is a conceptual framework developed to inform current theory, policy, and practice. While theories that partially explain the digital divide do exist (e.g., van Dijk et al., 2012), these are limited as they do not forefront a social justice perspective – a viewpoint that serves to unveil the digital inequities experienced across the life-course. For this study, van Dijk's theory enabled understandings of the motivations behind ICT access and use, and made visible the types of resources and skills required to bridge the digital divide, however, it did not reveal the underlying systemic and structural challenges, often influenced by one's social position.

To address this limitation, we merged aspects of van Dijk's theory with key tenets of intersectionality, which informed the development of a Social Justice Framework for Bridging the Digital Divide (Figure 2). Our framework affirms, firstly, that individuals exist within structures and systems designed by and for persons in more advantageous social positions, which creates modes of differentiation across groups and divisive access to digital resources. As such, our framework emphasizes the importance of recognizing and responding to the multiple layers of access and use inequities that various people might experience. Such differential barriers require socially conscious facilitators that not only address challenges of ICT use, but complex problems associated with ICT access by reshaping existing structures and systems to enable more equal distribution of resources (i.e. ICTs, ICT services and supports), while challenging current social norms and beliefs surrounding the digital divide.

Secondly, intersectionality affirms that individual lives cannot be reduced to single traits nor can single traits accurately depict understandings of individual experiences (Hankivsky, 2014). However, none of the studies included in this review examined social factors with this lens and the majority did not consider socioeconomic contributors at all. Our framework further

recommends the identification of key social factors (with the understanding that these are inseparable) to distinguish where an individual is situated along the continuum of advantaged or disadvantaged positionalities—noting that both evolve over the life-course and are complicated by the aging process.

From a policy perspective, our framework stresses the importance of understanding and responding to the mechanisms of how varied social positioning can create distinct, and often multiple, barriers for various subgroups. More affluent groups, for instance, have a higher likelihood of experiencing ICT challenges related to lack of knowledge, self-efficacy, and social support, whereas more disadvantaged groups experience additional cost-related and fundamental educational challenges. It is recommended that policy interventions should actively involve investments in more deprived areas, either for individuals to purchase devices and supplements for Internet subscription, or for public institutions to provide free access to devices and support for knowledge acquisition (e.g., training) and technical problems (e.g., troubleshooting). Providing tailored, affordable, encouraging, and relevant training opportunities to middle-aged and older adults at convenient locations, such as seniors' centers and libraries, is suggested, though training and support in the home may be preferred (Larsson et al., 2013). Since most information is now available online (almost exclusively in some cases), it is also important to launch campaigns that promote the added value of ICTs by including middle-aged and older adults in the design and development of ICTs and ICT advertisements. Such an approach can help encourage adoption and usage while simultaneously challenging existing ageist stereotypes of the 'outdated senior'.

Lastly, our framework highlights how individualized usability and accessibility processes can influence the uptake and ongoing use of ICTs. For example, an older adult may not always prefer to use a product that was designed and marketed for seniors, particularly if they do not see

themselves as an *older person* or as in need of specialty products. Since, "universal design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability" (Centre for Excellence in Universal Design, 2014), encouraging technology developers to apply universal design principles in the development of products could improve access and use for all ICT users, particularly those with physical disabilities or cognitive challenges who might otherwise be excluded. This could be fostered through regulations as well as policy guidelines.

In terms of limitations of our study, firstly, our inclusion criteria was too broad in scope, which contributed to a high quantity, and perhaps increased heterogeneity of results during early review stages (i.e., title and abstract screening) of article selection process. Secondly, due to resource constraints, only articles available in English were included. As such, there may be literature published in other languages that could have contributed a different knowledge base to the study. Thirdly, majority of the studies included were situated within the American context. Studies from the U.S. can provide important direction for understanding the digital divide, however these findings may not be transferable to environmental and social contexts outside America.

In conclusion, the importance of enhancing active participation in a digital society is a key priority, given the benefits technology can have on social participation and wellbeing in later-life (Chopik, 2016). To enhance this area of research and development necessitates further understanding of the inseparable social factors required to mitigate digital inequities. In responding to the multiple burdens that some middle-aged and older adults might face by establishing additional contingencies and supports, as outlined in our framework, we hope to envisage increased ICT access and use in the future.

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Table 1. Electronic sources searched for the realist synthesis.

Databases and Search Engines
PsychINFO
CINAHL
Web of Science
MedLine
AgeLine
Women's Studies International
Communication & Mass Media
Academic Search Premier
LISTA
Social Sciences Full Text
Academic Search Complete
Global Health
Sociological Abstracts
Google Scholar

Table 2. Search terms used in electronic databases and search engines.

	Search Terms
Middle-aged & older adults	'Older adult*', 'Aging', 'Ageing', 'Aged', 'Senior*', 'Elder*', 'Middle age*'
Information & communication technologies	'Information and communication techno*', 'Communication techno*', 'Information techno*', 'ICT', 'Internet', 'Internet use', Computer*', 'Computer* use', 'App*', 'Smartphone*'
Digital divide	'Digital divide', 'ICT access', 'Techno* access', 'Techno* inequality', 'Information gap', 'Computer literacy', 'Access to computer*'

Table 3. Key findings of other social determinants associated with ICT access and use.

Author(s) & Year	Other Social Determinants of ICT Use	Key Findings
Atkinson, Black, & Curtis, 2008; Choi & DiNitto, 2013; Choudrie, Ghinea, & Songonuga, 2013; Echt & Burridge, 2011; Friemel, 2016; Gan et al., 2016; Yu, Ellison, McCammon, & Langa, 2016	Disability Status	Findings were varied on how disability affected access to and use of ICTs; having a learning disability or cognitive issues, vision, hearing, or hand-related disability (e.g., arthritis) was associated with lower use
Goodall, Ward, & Newman, 2010; Haight, Quan-Haase, & Corbett, 2014; Jung et al., 2010	Immigration Status	Findings highlight that native-born and established immigrants are more likely to access the Internet than recent immigrants; recent immigrants who do access the Internet engaged in more Internet activities than native-born or established immigrants; psychological determinants (e.g., computer anxiety, self-efficacy, aging anxiety) are strong deterrents of computer use
Haight et al., 2014	Urban/Rural Residence	Findings suggest that urban respondents were 51% more likely to have Internet access compared to rural respondents
Colombo, Aroldi, & Carlo, 2015; Friemel, 2016; Graham, 2010; Ellison, & McCammon, 2015	Relationship Status	Findings suggest that widows or older adults living alone were less likely to use or access ICTs, though this was not consistent across studies

Table 4. Summary of motivators for ICT use.

Author(s) & Year	Motivator for ICT use	Explanation
Graham, 2010; Haight, Quan-Haase, & Corbett, 2014; Larsson, Larsson-Lund, & Nilsson, 2013; Neves & Amaro, 2012	Information access	Accessing useful information online to stay informed
Goodall, Ward, & Newman, 2010; Haight et al., 2014; Hill, Betts, & Gardner, 2015; Neves & Amaro, 2012; Omotayo, 2015; Wu, Damnée, Kerhervé, & Ware, 2015	Staying connected	Staying connected with family, friends, and to services and service providers
Hill et al., 2015; Larsson et al., 2013; Lee, Han, & Chung, 2014; Tsai, Shillair, Cotten, Winstead, & Yost, 2015; Wu et al., 2015	Personal enjoyment	Engaging in enjoying activities and leisure
Friemel, 2016; Hashizume & Kurosu, 2012; Larsson et al., 2013; Lee et al., 2014; Niehaves & Plattfaut, 2014; Omotayo, 2015; Quan-Haase, Martin, & Schreurs, 2016; Tsai et al., 2015; Wu et al., 2015	Social encouragement	Social encouragement or pressure can be a motivator, particularly when provided to gain access and learn how to use ICTs
Chu, Huber, Mastel-Smith, & Cesario, 2009; Hashizume & Kurosu, 2012; Lam & Lee, 2006; Larsson et al., 2013; McDonough & Kingsley, 2015; Wu et al., 2015	Social support & training	Receiving ongoing supportive training that is encouraging, affordable, tailored, and culturally relevant can increase motivation
Hashizume & Kurosu, 2012; Niehaves & Plattfaut, 2014; Peral-Peral, Arenas-Gaitán, & Villarejo-Ramos, 2015	Individual characteristics	Personal attributes, such as curiosity, confidence, and being adventurous, can motivate ICT use
Lam & Lee, 2006; Larsson et al., 2013; Quan-Haase et al., 2016	Broadening knowledge	Broadening knowledge on various topics to connect better with friends and family

Table 5. Summary of detractors to ICT use.

Author(s) & Year	Detractor	Explanation
Quan-Haase, Martin, & Schreurs, 2016	Superficiality of ICTs	Negative beliefs that ICTs are a superficial way to communicate and information obtained via ICTs is questionable
Gazibara et al., 2016; McDonough & Kingsley, 2015	Perception of little or no added value	Belief that there is no added value to using ICTs; consider ICT use a waste of time
Chang, McAllister, & McCaslin, 2015; Hashizume & Kurosu, 2012; Hill, Betts, & Gardner, 2015; Wu, Damnée, Kerhervé, & Ware, 2015	Lack of skills and familiarity	Feelings that ICTs can be anxiety-provoking, perceived as something too difficult to learn, lead to damaged equipment, and constantly changing
Choudrie, Ghinea, & Songonuga, 2013; Hill et al., 2015	Fear of cybercrime	Concerns around maintaining privacy and protecting oneself from cybercrime
Casado-Muñoz, Lezcano, & Rodríguez-Conde, 2015	Lack of interest	General dislike for ICTs and lack of interest

Table 6. Articles that identify facilitators and barriers to ICT use according to positions of disadvantage, age, and other inequity markers.

Author(s) & Year	Social Position	Age Group	Gender	Inequity Markers	Barrier(s)	Facilitator(s)
Atkinson et al. (2008)	Limited education, low-income, working class	65+	Women & men	Disability, poor health or chronic health condition	Limited income to purchase ICTs and services to support ICT use; limited knowledge or understanding of ICTs	ICT usage training; providing access to hardware and software resources in community centers, public libraries, and cafes; invest resources in deprived areas of the city with limited ICT resources; ongoing technical support
Casado-Muñoz (2015)	Limited education, working class	65 – 75	Mostly women housewives	Gendered roles & responsibilities	Limited income to purchase ICTs and services to support ICT use; limited knowledge or understanding of ICTs; lack of interest in ICTs	Demonstrated perceived usefulness to assist with everyday life and increased quality of life
Graham, (2009)	Non-white, limited education, working class	50+	Women & men	Working in high stress, manual labor job	Limited income to purchase ICTs and services to support ICT use; limited knowledge or understanding of ICTs	Consideration for the social context of peoples' everyday lives as it pertains to enhancing ICT access and use; incorporate the meanings people attribute to ICT in their everyday lives

Jung et al. (2010)	Non-white, limited education, working class	66 – 89	Women & men	Immigrant status	Computer anxiety; aging anxiety; lack of computer self-efficacy or computer experience	Perceived social support; previous experience with computers
Choudrie et al. (2013)	Non-white, limited education, working class	51 – 80	N/A	Disability & learning difficulties, such as dyslexia	Negative perceptions of technology; lack of access to internet; lack of confidence; poor service quality; language barriers, fear of technology	Positive perceptions of technology; providing access to hardware and software resources to community centers, public libraries and cafes
Denizard-Thompson et al. (2011)	Non-white, limited education, working class	18 – 88 (*M*=50)	N/A	Poor health or chronic health condition	Lack of physical access to computers or Internet	Demonstrated perceived usefulness to assist with everyday life and increased quality of life
Echt & Backscheider Burridge et al. (2011)	Non-white, limited education, working class	N/A	N/A	N/A	Lower levels of income, education and health literacy; lack of physical access to computers or Internet	Higher levels of health literacy and education; internet training; support for new users, design and content that is age-friendly
Gan et al. (2016)	Non-white, limited education, working class	45 – 59	Women & men	Disability, poor health or chronic health condition	Limited income to purchase ICTs and services to support ICT use; limited knowledge or understanding of ICTs	Financial means to access ICTs; having less household members to support
Yu et al., (2016)	Non-white, limited education, working class	55+	Women & men	Disability, poor health or chronic health condition; gendered roles & responsibilities	Limited education; living with poor, cognition or chronic health conditions	Enhanced public access to hardware and software resources such as community centers, public libraries, and cafes

Note: Information that was not available is indicated by N/A.

Table 7. Articles that identified facilitators and barriers to ICT use according to positions of privilege, age group and gender.

Author(s) & Year	Social Position	Age Group	Gender	Barrier(s)	Facilitator(s)
Abbey & Hyde (2013)	White, educated, upper-middle class	65+	Women & men	Computer anxiety; lack of access to a computer and Internet; lack of exposure to ICTs	Practice and exploration time; access to computers; language translation feature on website; instructor encouragement, peer encouragement
Birkland & Kaars-Brown (2012)	Educated, middle class	65 – 75	Women	Lack of operational skills using ICTs; lack of understanding of value of ICTs	Increased assistance in learning; using and purchasing ICTs
Neves & Amaro (2012)	Educated, middle class	64+	Women & men	Limited ICT literacy; perceived fear of using the Internet; lack of access to computer & Internet	Assistance with using digital literacy; having the Internet set up by an experienced person
Kania-Lundholm & Torres (2015)	White, educated, middle class	66 – 89	Women & men	Limited ICT literacy; lack of access to computer & Internet	N/A
Friemel (2016)	Educated, middle class	65+	N/A	Physical health issues; complexity of Internet use; lack of social support	Encouragement by family and friends; private learning settings; promote messaging of benefits of Internet use
McMurtrey et al. (2008)	Educated, middle class	N/A	N/A	Physical dexterity issues (deterioration of manual dexterity & vision)	N/A
Quan-Haase et al. (2016)	Educated, middle class	60+	Women	Lack of familiarity with ICTs	Feeling, safe, secure comfortable and confident about using ICTs
van Deursen & van Dijk (2011)	White, educated, middle class	55 – 80	N/A	Lack of exposure to ICTs	Increased exposure to computer use and the Internet

Note: Where race/ethnicity can be discerned, this is included as a component of social position. Information that was not available is indicated by N/A.

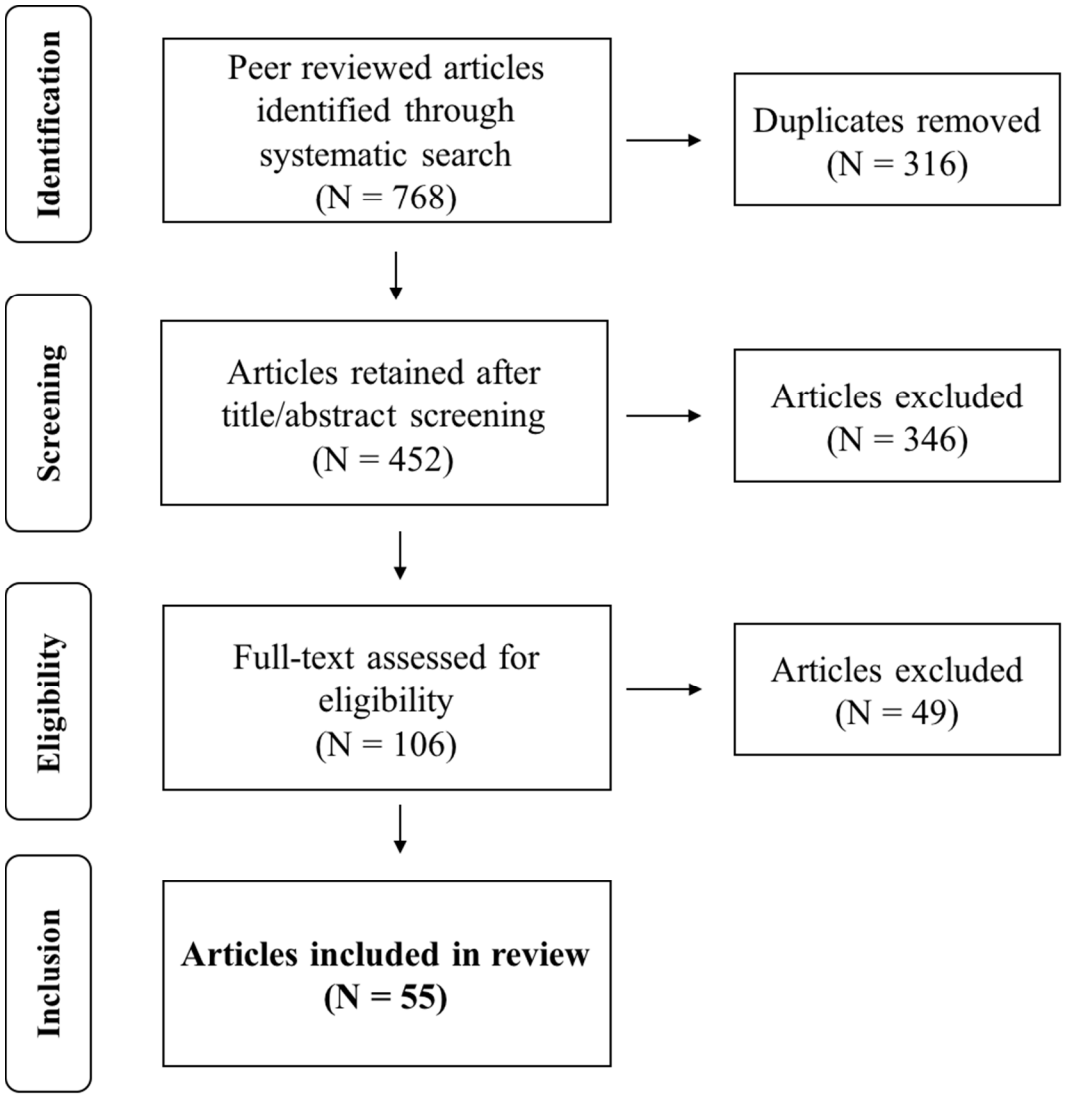

Figure 1. Realist synthesis search strategy.

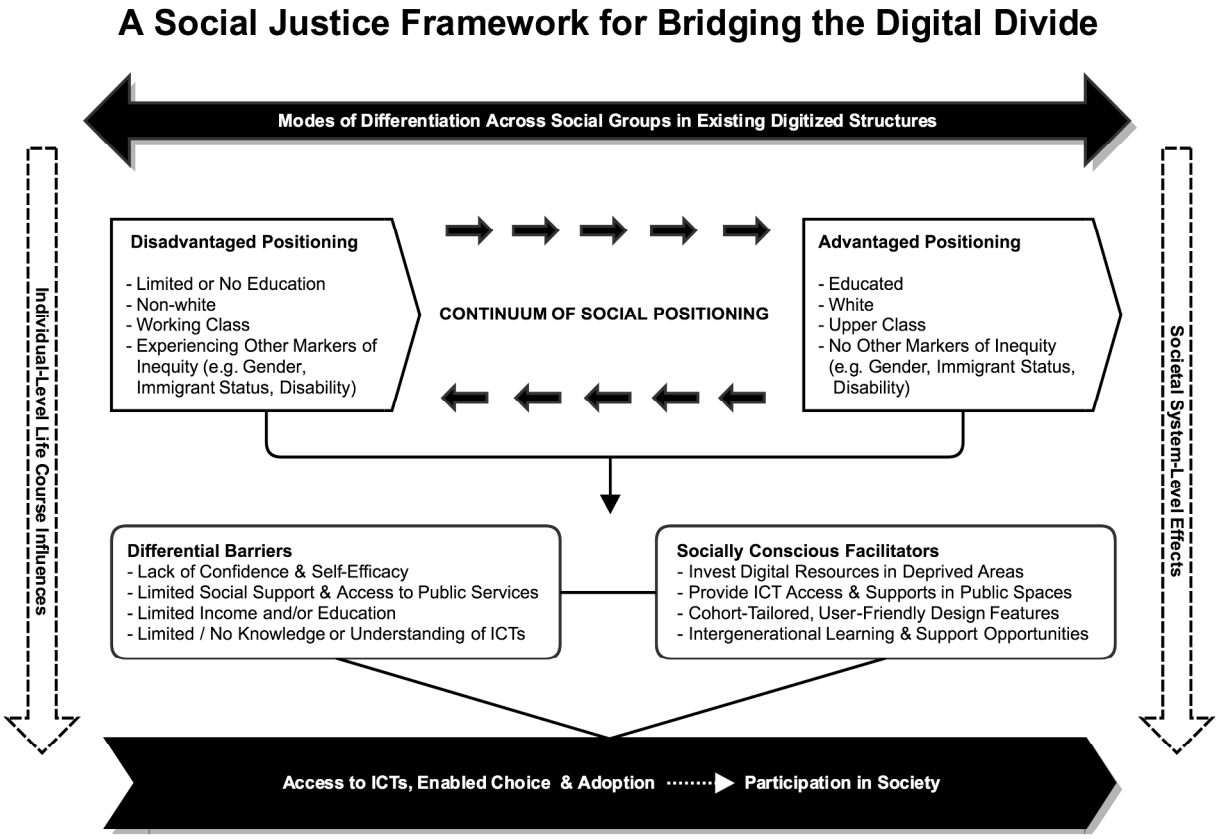

Figure 2. A social justice framework for mitigating ICT access and use challenges in a digital world.